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10/652,341

09/02/2003

Mathew Manu

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SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

HERNANDEZ, JOSIAH J

ART UNIT

PAPER NUMBER

2626

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DELIVERY MODE

10/19/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/652,341

Applicant(s)

MANU, MATHEW

Examiner

Josiah Hernandez

Art Unit

2626

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION:

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-12, 14-38, and 40-43 is/are rejected.
- 7) ☒ Claim(s) 5, 13 and 39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 September 2003 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. Claims 42 and 43 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The added limitation (using long CMDCT as opposed to long FFT) is deemed as new matter given that the limitations were not included in prior specifications and claims and therefore will not be considered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4, 6-10, 12, 14-16, 35-36, 38, 40, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Budnikov (US PGPub 2003/0215013) in view of Park et al. (US 5,732,386), and in further view of Levine (US 6,266,644), Li (US PGPUB 2003/0187634) and Goodwin (US PGPUB 2003/0093282).

As to claims 1 and 9, Budnikov discloses a digital encoding method (see abstract and paragraph [0002]) comprising: determining a type of window according to a characteristic of an input audio signal (once the input signal enters the system the adaptive grouping psychoacoustic model determines the type of window) (see abstract, paragraph [0023] lines 1-10); generating a modified discrete cosine transform spectrum from the input audio signal (see paragraph [0025] lines 7-10); and performing a psychoacoustic model analysis by using the generated transform signals (see paragraphs [0023] lines 1-5; [0025] lines 4-10). Budnikov does not specifically disclose generating a complex modified discrete cosine transform (CMDCT) or a Fast Fourier Transform (FFT) spectrum from the input audio signal according to the determined window type. Park teaches the use of the real and imaginary parts of the transform in the form of cosine and sine which translates into MDCT and MDST (see abstract). The CMDCT is made up of the MDCT and the MDST. Park teaches an audio encoding method (see column 1 lines 25-29), which chooses a window type (see column 1 lines

33-35, 43-46; column 2 lines 15-18) and generates a MDCT spectrum from the input audio according to the window type (see column 1 lines 35-41; column 2 lines 10-20). Levine teaches an audio encoding method (see abstract) which chooses a window type (by classifying a signal as either transient or steady state) (see column 2 lines 15-18, 45-52; column 5 lines 20-25) and generating FFT spectrum from the input signal according to the window type (if the a transient model is used in the system then the FFT will use short frames (see column 2 lines 18-20; column 3 lines 50-53; column 4 lines 15-22).

Budnikov also does not disclose specifically performing CMDCT/MDCT then passing the transformed signal to a psychoacoustic model for further processing. Goodwin teaches having a MDCT analysis window circuit then taking the transformed signal into a psychoacoustic model (paragraph [0105]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of CMDCT (which is a combination of MDCT and MDST) and FFT as taught by Park and Levine respectively and the use of MDCT analysis before the use of the psychoacoustic model. Using a CMDCT can reduce the complexity of encoding a two-channel or multi-channel digital audio signal (see Park column 1 lines 20-24) by providing a relatively simple construction while maintaining high voice quality (see Park column 1 lines 47-50). Using an FFT along with a CMDCT allows for the system to efficiently handle certain types of signals like transient signals by assigning long window frames to

the CMDCT and shorter frames to the FFT upon receiving a transient signal (see Levine column 4 lines 15-21), lastly using the MDCT analysis before the psychoacoustic model enable the model to process the signal in frequency for further processing as opposed to time domain where characteristics of the frequency cannot be analyzed.

As to claims 2, and 10, Budnikov discloses dividing the input audio signal into a plurality of subbands by filtering the input audio signal (the dividing of a signal into subbands is done by a filter analyzer) (see figure 5 #12), and the step for determining the window type is preformed for the input audio signal divided into subbands (see figure 5 #'s 54 and 24).

Budnikov does not disclose specifically window switching after signal is separated into different subbands. Li teaches after channel separation, each component of audio is then transformed using switching window (paragraph [0014])

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of switching windows after subband separation. Such techniques are well known to those skilled in the art (paragraph [0067]).

As to claims 4 and 12, Budnikov does not specifically disclose choosing long windows for CMDCT or short windows for FFT. Levine teaches an audio

encoding method (see abstract) which chooses a window type (by classifying a signal as either transient or steady state) (see column 2 lines 15-18, 45-52; column 5 lines 20-25) and generating FFT spectrum from the input signal according to the window type (if the a transient model is used in the system then the FFT will use short frames and long frames for the cosine transform (see column 2 lines 18-20; column 3 lines 50-53; column 4 lines 15-22). Using an FFT along with a CMDCT allows for the system to efficiently handle certain types of signals like transient signals by assigning long window frames to the CMDCT and shorter frames to the FFT upon receiving a transient signal (see Levine column 4 lines 15-21).

As to claims 6 and 14, Budnikov discloses if the input audio signal is a transient signal, the type of the window is determined as a short window, and if the input audio signal is not a transient signal, the type of the window is determined as a long window (Budnikov states that MPEG encoders use short sections at the presences of a transient signal and a longer section in the absence of transient signals) (see paragraph [0007]).

As to claims 7 and 15, Budnikov discloses performing quantization and encoding based on the result of the psychoacoustic model analysis performed (see figure 5 #'s 54, 16, and 18).

As to claims 8 and 16, Budnikov discloses the psychoacoustic model is a model used by one in a group comprising a motion picture expert's group (MPEG)-1 layer 3, and MPEG-2 advanced audio coding (AAC), an MPEG-4, and a windows media audio (WMA) (see paragraph [0025]).

As to claim 35, Budnikov discloses a computer-readable recording medium for recording a computer program code for enabling a computer to provide a service of encoding input audio signals, the service comprising steps of (see paragraph [0032]): a digital encoding method (see abstract and paragraph [0002]) comprising: determining a type of window according to a characteristic of an input audio signal (once the input signal enters the system the adaptive grouping psychoacoustic model determines the type of window) (see abstract, paragraph [0023] lines 1-10); generating a modified discrete cosine transform spectrum from the input audio signal (see paragraph [0025] lines 7-10); and performing a psychoacoustic model analysis by using the generated transform signals (see paragraphs [0023] lines 1-5; [0025] lines 4-10). Budnikov does not specifically disclose generating a complex modified discrete cosine transform (CMDCT) or a Fast Fourier transform (FFT) spectrum from the input audio signal according to the determined window type. Park teaches the use of the real and imaginary parts of the transform in the form of cosine and sine which translates into MDCT and MDST (see abstract). Park teaches an audio encoding method (see column 1 lines 25-29), which chooses a window type (see column 1 lines

33-35, 43-46; column 2 lines 15-18) and generates a CMDCT spectrum from the input audio according to the window type (see column 1 35-41; column 2 lines 10-20). Levine teaches an audio encoding method (see abstract) which chooses a window type (by classifying a signal as either transient or steady state) (see column 2 lines 15-18, 45-52; column 5 lines 20-25) and generating FFT spectrum from the input signal according to the window type (if the a transient model is used in the system then the FFT will use short frames (see column 2 lines 18-20; column 3 lines 50-53; column 4 lines 15-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of CMDCT and FFT as taught by Park and Levine respectively. Using a CMDCT can reduce the complexity of encoding a two-channel or multi-channel digital audio signal (see Park column 1 lines 20-24) by providing a relatively simple construction while maintaining high voice quality (see Park column 1 lines 47-50). Using an FFT along with a CMDCT allows for the system to efficiently handle certain types of signals like transient signals by assigning long window frames to the CMDCT and shorter frames to the FFT upon receiving a transient signal (see Levine column 4 lines 15-21).

As to claim 36, Budnikov discloses a computer-readable recording medium (see paragraph [0032]) of which performs dividing the input audio signal into a plurality of subbands by filtering the input audio signal (the dividing of a

signal into subbands is done by a filter analyzer) (see figure 5 #12), and the step for determining the window type is preformed for the input audio signal divided into subbands (see figure 5 #'s 54 and 24).

As to claim 38, Budnikov discloses a computer-readable recording medium (see paragraph [0032]) of which Budnikov does not specifically disclose choosing long windows for CMDCT or short windows for FFT. Levine teaches an audio encoding method (see abstract) which chooses a window type (by classifying a signal as either transient or steady state) (see column 2 lines 15-18, 45-52; column 5 lines 20-25) and generating FFT spectrum from the input signal according to the window type (if the a transient model is used in the system then the FFT will use short frames and long frames for the cosine transform (see column 2 lines 18-20; column 3 lines 50-53; column 4 lines 15-22). Using an FFT along with a CMDCT allows for the system to efficiently handle certain types of signals like transient signals by assigning long window frames to the CMDCT and shorter frames to the FFT upon receiving a transient signal (see column 4 lines 15-21).

As to claim 40, Budnikov discloses a computer-readable recording medium (see paragraph [0032]) of which if the input audio signal is a transient signal, the type of the window is determined as a short window, and if the input

audio signal is not a transient signal, the type of the window is determined as a long window (Budnikov states that MPEG encoders use short sections at the presences of a transient signal and a longer section in the absence of transient signals) (see paragraph [0025]).

As to claim 41, Budnikov discloses a computer-readable recording medium (see paragraph [0032]) of which performs quantization and encoding based on the result of the psychoacoustic model analysis performed (see figure 5 #'s 54, 16, and 18).

3. Claims 3, 11, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Budnikov (US PGPub 2003/0215013) in view of Park et al. (US 5,732,386) in further view of Levine (US 6,266,644), as applied to claims 1, 2, 4, 6-10, 12, 14-16, 35-36, 38, 40, and 41, and in further view of Chen et al. (US PGPub 2003/0115042).

As to claims 3 and 11, Budnikov does not disclose specifically using a poly-phase filter bank. Chen teaches the use of a polyphase/MDCT filter bank in MP3 encoding (see paragraph [0044]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of a polyphase filter bank. Doing so would have allowed for stereo or multi-channel signals to be analyzed more efficiently.

As to claim 37, Budnikov discloses a computer-readable recording medium (see paragraph [0032]). Budnikov does not disclose specifically using a poly-phase filter bank. Chen teaches the use of a polyphase/MDCT filter bank in MP3 encoding (see paragraph [0044]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have further modified the encoding system disclosed by Budnikov, Levine, and Park with the use of a polyphase filter bank. Doing so would have allowed for stereo or multi-channel signals to be analyzed more efficiently.

4. Claims 17-22, 24-31, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Budnikov (US PGPub 2003/0215013) in view of Park et al. (US 5,732,386) and in further view of Goodwin (US PGPUB 2003/0093282) and Li (US PGPUB 2003/0187634).

As to claims 17 and 26, Budnikov discloses a digital encoding method (see abstract and paragraph [0002]) comprising: generating a modified discrete cosine transform spectrum from the input audio signal (see paragraph [0025] lines 7-10); and performing a psychoacoustic model analysis by using the generated transform signals (see paragraphs [0023] lines 1-5; [0025] lines 4-10). Budnikov does not specifically disclose generating a complex modified discrete cosine transform (CMDCT). Park teaches the use of the real and imaginary parts

of the transform in the form of cosine and sine which translates into MDCT and MDST (see abstract). Park teaches an audio encoding method (see column 1 lines 25-29), which chooses a window type (see column 1 lines 33-35, 43-46; column 2 lines 15-18) and generates a MDCT spectrum from the input audio according to the window type (see column 1 lines 35-41; column 2 lines 10-20). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of CMDCT (which is a combination of MDCT and MDST) as taught by Park. Using a CMDCT can reduce the complexity of encoding a two-channel or multi-channel digital audio signal (see column 1 lines 20-24) by providing a relatively simple construction while maintaining high voice quality (see column 1 lines 47-50).

Budnikov also does not disclose specifically performing CMDCT/MDCT then passing the transformed signal to a psychoacoustic model for further processing. Goodwin teaches having a MDCT analysis window circuit then taking the transformed signal into a psychoacoustic model (paragraph [0105]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of CMDCT (which is a combination of MDCT and MDST) as taught by Park and the use of MDCT analysis before the use of the psychoacoustic model. Using a CMDCT can reduce the complexity of encoding a two-channel or multi-channel digital audio signal (see Park column 1 lines 20-

24) by providing a relatively simple construction while maintaining high voice quality (see Park column 1 lines 47-50). Using an FFT along with a CMDCT allows for the system to efficiently handle certain types of signals like transient signals by assigning long window frames to the CMDCT and shorter frames to the FFT upon receiving a transient signal (see Levine column 4 lines 15-21), lastly using the MDCT analysis before the psychoacoustic model enable the model to process the signal in frequency for further processing as opposed to time domain where characteristics of the frequency cannot be analyzed.

As to claim 18, 27, Budnikov discloses the method of claim, 17, wherein the step further comprise: generating a long MDCT spectrum and a short MDCT by applying a long window and a short window to an input audio signal (once the input signal enters the system the adaptive grouping psychoacoustic model determines the type of window) (see figure 5 # 24, abstract, paragraph [0023] lines 1-10). Budnikov does not specifically disclose generating a complex modified discrete cosine transform (CMDCT). Park teaches the use of MDCT and MDST (see abstract) (of which is the real and imaginary parts of the transform in the form of cosine and sine which translates into MDCT and MDST thus together make up the CMDCT). Park teaches an audio encoding method (see column 1 lines 25-29), which chooses a window type (see column 1 lines 33-35, 43-46; column 2 lines 15-18) and generates a CMDCT spectrum from the input audio

according to the window type (see column 1 35-41; column 2 lines 10-20). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of CMDCT as taught by Park. Using a CMDCT can reduce the complexity of encoding a two-channel or multi-channel digital audio signal (see column 1 lines 20-24) by providing a relatively simple construction while maintaining high voice quality (see column 1 lines 47-50).

As to claims 19 and 28, Budnikov discloses performing a psychoacoustic model analyses by using the long MDCT spectrum and short MDCT spectrum generated (Budnikov does this by applying psychoacoustic perceptual entropy thresholds to the short or long window sizes (see paragraph [0025], figure 5 #'s 54, 26, and 58). Budnikov does not specifically disclose generating a complex modified discrete cosine transform (CMDCT). Park teaches the use of the real and imaginary parts of the transform in the form of cosine and sine which translates into MDCT and MDST (see abstract). Park teaches an audio encoding method (see column 1 lines 25-29), which chooses a window type (see column 1 lines 33-35, 43-46; column 2 lines 15-18) and generates a CMDCT spectrum from the input audio according to the window type (see column 1 35-41; column 2 lines 10-20). Using a CMDCT can reduce the complexity of encoding a two-channel or multi-channel digital audio signal (see column 1 lines 20-24) by

providing a relatively simple construction while maintaining high voice quality (see column 1 lines 47-50).

As to claims 20, and 29, Budnikov discloses dividing the input audio signal into a plurality of subbands by filtering the input audio signal (the dividing of a signal into subbands is done by a filter analyzer) (see figure 5 #12), and the step for determining the window type is preformed for the input audio signal divided into subbands (see figure 5 #'s 54 and 24).

Budnikov does not disclose specifically window switching after signal is separated into different subbands. Li teaches after channel separation, each component of audio is then transformed using switching window (paragraph [0014])

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of switching windows after subband separation. Such techniques are well known to those skilled in the art (paragraph [0067]).

As to claims 21 and 30, Budnikov discloses determining a type of a window, according to a characteristic of the input audio signal (Budnikov teaches that for MPEG encoders if the input signal is a transient signal than the window

size becomes shorter and longer if no transient signals exists) (see paragraph [0007]).

As to claims 22 and 31, Budnikov discloses determining a type of a window, according to a characteristic of the input audio signal (Budnikov teaches that for MPEG encoders if the input signal is a transient signal than the window size becomes shorter and longer if no transient signals exists) (see paragraph [0025]).

As to claims 24 and 33, Budnikov discloses determining a window type is the long window, quantization and encoding of a long MDCT spectrum are performed based on a result of the psychoacoustic model analysis performed in the step, and if the window type determined is the short window, quantization and encoding of a short MDCT spectrum are performed based on the result of the psychoacoustic model analysis performed (Budnikov teaches using psychoacoustic models for choosing a window size for the MDCT signal and then quantizing and encoding) (see figure 5 #'s 54, 22, 24, 26, 58, 16, and 18; paragraphs [0025] lines 1-10, [0030]).

As to claims 25 and 34, Budnikov discloses the psychoacoustic model is a model used by one in a group comprising a motion picture expert's group

(MPEG)-1 layer 3, and MPEG-2 advanced audio coding (AAC), an MPEG-4, and a windows media audio (WMA) (see paragraph [0025]).

5. Claims 23 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Budnikov (US PGPub 2003/0215013) in view of Park et al. (US 5,732,386) as applied to claims 17-22, 24-31, 33, and 34, and in further view of Chen et al. (US PGPub 2003/0115042).

As to claims 23, and 32, Budnikov does not disclose specifically using a poly-phase filter bank. Chen teaches the use of a polyphase/MDCT filter bank in MP3 encoding (see paragraph [0044]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the encoding system disclosed by Budnikov with the use of a polyphase filter bank. Doing so would have allowed for stereo or multi-channel signals to be analyzed more efficiently.

Allowable Subject Matter

Art Unit: 2626

6. Claims 5, 13, and 39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

As to claim 5, 13, and 39, the prior art of record, either alone or in combination, does not teaches or fairly suggests the limitation of determining a window type to be a short window, a short CMDCT spectrum is generated by applying a short window and a long FFT spectrum is generated by applying a long window and the psychoacoustic model analysis is performed based on the generated short CMDCT spectrum and long FFT spectrum.

Conclusion


A note has been made to notify the appropriate parties that the examiner has moved from Art Unit 2609 to 2626.

Any inquiry concerning this communication should be directed to Josiah Hernandez whose telephone number is 571-270-1646. The examiner can normally be reached from 7:30 pm to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JH


DAVID HUDSPETH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600